

Experimental Simulation of Solar Wind – Magnetic Anomalies and Wakes

YEO Li Hsia¹, WANG Xu¹, MUNSAT Tobin¹, HORANYI Mihaly¹, ¹Laboratory for Atmospheric and Space Physics

Introduction: The Colorado Solar Wind Experiment (CSWE) simulates solar wind of up to 1keV in the laboratory by producing a high energy plasma beam. We present two sets of experimental results related to surface interaction of the solar wind with airless bodies - solar wind interaction with magnetic anomalies and the variation of wake structures with changing Debye lengths. Firstly, lunar magnetic anomalies are localized regions of magnetic intensity on the moon result in both magnetic and electrostatic deflection/reflection of charged particles in the presence of solar wind. By studying the potential profiles above a surface with an embedded magnetic dipole, we find that at low ion beam energies, the surface potential agrees with theoretical predictions (follows the ion beam energy), but at higher ion beam energies, surface potentials are significantly lower than expected. Secondly, when solar wind encounters an obstacle, heavier ions stream right by, while electrons fill in the space behind, forming a charge-separated plasma wake. We report results on the structure of wakes as object size varies with respect to the plasma Debye length by discussing the changes in electron and ion properties, as well as electric potentials in the object's environment.